CLAIMS

What is claimed is:

1. A method for fueling an internal combustion engine, comprising the steps of:

a) providing a first fueling system for selectively metering a hydrocarbon fuel to said engine;

b) providing a second fueling system for selectively metering a hydrogen-containing fuel gas to said engine; and

c) selecting and controlling a ratio of amounts of hydrocarbon fuel and hydrogen-containing fuel gas provided by said first and second systems to said engine.

2. A method in accordance with Claim 1 wherein said hydrocarbon fuel is selected from the group consisting of gasoline, diesel fuel, and ethanol.

3. A method in accordance with Claim 1 wherein said hydrogen-containing fuel gas is hydrocarbon reformate.

4. A method in accordance with Claim 1 wherein said hydrogen-containing fuel gas is hydrogen gas.

5. A method for fueling an internal combustion engine with a hydrocarbon fuel and a hydrogen-containing fuel gas, comprising the steps of:

a) starting said engine on a mixture of said fuel and said fuel gas wherein at least 90% of the motive energy of said engine is derived from said hydrogen-containing fuel gas; and

b) progressively changing the supply ratio between said hydrocarbon fuel and said hydrogen-containing fuel gas such that, when said engine reaches an

equilibrium operating temperature, an optimum fraction of the motive energy of said engine is derived from said hydrocarbon fuel.

6. A method in accordance with Claim 5 wherein said optimum fraction is at least 90%.

7. A method in accordance with Claim 5 wherein 100% of the motive energy of said engine is derived from said hydrogen-containing fuel gas during said starting of said engine.

8. A method in accordance with Claim 5 further comprising a first step of cranking said engine on a mixture of up to 100% of hydrogen fuel prior to said starting step, to optimize engine start time.

9. A method in accordance with Claim 5 wherein said supply ratio is optimally changed to minimize levels of unburned hydrocarbons in an exhaust stream of said engine.

10. A method in accordance with Claim 5 wherein said supply ratio is changed by adding hydrocarbon fuel to provide a second engine torque that exceeds a first engine torque that said optimum fraction can provide.

11. A system for fueling an internal combustion engine with a hydrocarbon fuel and a hydrogen-containing fuel gas, comprising:

a) a hydrocarbon fuel supply system; and

b) a hydrogen-containing fuel gas supply system.

12. A system in accordance with Claim 11 wherein said hydrogen-containing fuel gas supply system is a pressure vessel.

13. A system in accordance with Claim 11 wherein said hydrogen-containing fuel gas supply system is a hydrocarbon fuel reformer.

14. A system in accordance with Claim 11 further comprising a control system for regulating relative supply of said hydrocarbon fuel and said hydrogen-containing fuel gas at any given time.

15. A system in accordance with Claim 14 wherein an amount of hydrogen-containing fuel gas supplied to said engine is in a range between 0% and 100%.

16. A system in accordance with Claim 11 wherein said hydrogen-containing fuel gas is hydrocarbon reformate, and wherein said hydrogen-containing fuel gas supply system includes a hydrocarbon catalytic reformer.

17. A system in accordance with Claim 16 wherein said reformer includes means for combustive preheating of catalytic elements in said reformer.

18. A system in accordance with Claim 16 wherein said hydrocarbon fuel supply system and said hydrogen-containing fuel gas supply system are each supplied with hydrocarbon fuel from a common hydrocarbon fuel reservoir.

19. A system in accordance with Claim 16 wherein said engine is fueled at least 90% by said reformate at engine start-up and by an optimum fraction of hydrocarbon fuel at engine steady-state operating conditions.

20. A system in accordance with Claim 19 wherein said optimum fraction is at least 90%.

21. An internal combustion engine comprising:

a) a hydrocarbon fuel supply system; and

b) a hydrogen-containing fuel gas supply system.

22. An engine in accordance with Claim 21 further comprising a control system for regulating relative supply of said hydrocarbon fuel and said hydrogen-containing fuel gas at any given time.

23. An engine in accordance with Claim 22 wherein said engine is fueled at least 90% by said hydrogen-containing fuel gas at engine start-up and by an optimum fraction of hydrocarbon fuel at engine steady-state operating conditions.